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relapse was similar (pt student= ns) when the analysis was done on the in silico plans. The margins reduction appears to avoid the inclusion in the high dose volume of about 100 cc of healthy brain (p=0.02) (Table 1). The target coverage was significantly worse in original than in the in silico plans (pt student <0.001) (Table 1), especially if the tumour was close to organs at risk (px2 <0.001). PTV coverage of original plans was significantly better with IMRT and helical-IMRT when compared with 3D ones (pAnova test=0.038). This difference was no more statistically significant with in silico planning (pAnova test= n.s.). Higher incidence of asthenia and leuko-encephalopathy was observed in patients with greater percentage of healthy brain included in the 57 Gy isodose (pAnova test=0.038 and 0.034).

Table 1:
Comparison between really delivered plans (GTV-CTV margin=2cm) and *in silico* plans (GTC-CTV margin =1cm)

		GTV-CTV 2cm	GTV-CTV 1cm	p
Pattern of recurrence	In field	60 (88%)	55 (81%)	n.s.
	Marginal	7 (10%)	10 (15%)	
	Distant	1 (2%)	3 (4%)	
Organ at risk	Brain – PTV	Median (range)	Median (range)	0.023
	percentage	80% (50%-97%)	88% (69%-98%)	
	cc	1080 cc (580-1446cc)	1175 cc (850-1547 cc)	
	Brain - isodose 95% (57 Gy)	Median (range)	Median (range)	<0.001
	percentage	75% (35%-95%)	83% (53%-98%)	
	cc	1004 cc (407-1364 cc)	1105 cc (605-1487 cc)	

Conclusion: No differences in the pattern of recurrence according to the extent of margins have been found. The incidence of asthenia and leuko-encephalopaty varies with the percentage of healthy brain included in the high dose volume. The margin reduction allows significant sparing of healthy cerebral tissue and could possibly reduce the incidence of late toxicity. Margin reduction is compatible with appropriate target coverage, thereby limiting the need for more sophisticated and costly techniques to selected cases.

PV-0227

Radiotherapy in elderly patients with lung cancer. Performance status and fractionation analysis

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Purpose or Objective: Elderly patients with lung cancer are often referred to treatment with radiotherapy. Tolerance to treatment and survival may be determined by their age and performance status. Different fractionation schedules in these patients can also influence the results.
Our objective was to analyze survival in patients ≥70 years, depending on age groups, Karnofsky Status (KPS) and fractionation schemes.

Material and Methods: We analyzed 70 patients, aged ≥70 years, with diagnostic of lung tumors (T1-4; N1-3), with no previous surgery treatments, referred for external radiotherapy.
Total Dose range: 20-64Gy; fractionation schedules: 1.8-2Gy (considered standard, std), >2Gy (hypofractionation/stereotactic SBRT) Karnofsky Performance Status (KPS), was the tool to evaluate functional status the first day of treatment, and analysis was performed with two KPS groups: <70 vs ≥ 70

Results: Global survival: mean 9months (m); median 8 m.
12m survival: 22patients (31,4%)
18m survival: 8pts (11,4%)
>23m survival: 4pts (5,7%)
AGE:
70-79y: mean 9m; median 8 m
≥80y: mean: 9,2m; median: 8 m
KARNOFSKY PERFORMANCE STATUS (KPS)
Survival:
KPS <70: mean: 9,2m; median: 8
KPS ≥70: mean: 9m; median: 8
FRACTIONATION SCHEDULE:
standard fx: 29 pts mean:9.2m; median: 8
hypofractionation: 34pts mean: 8m; median: 7 m
only SBRT: 7pts mean: 9.7m; median: 8.5m
fractionation survival:
≥6months: std: 20 pts (67%) hypofx: 19 (56%)
≥12m: std: 11pts (38%) hypofx: 9pts (26.4%)
≥18m: std: 5 pts (17.2%) hypofx: 2 pts (0,6%)

Conclusion: In elderly patients the most advanced age (> 80 years) does not determine differences in survival after radiotherapy treatment.
There are no differences in survival of elderly patients according to the KPS (<70 vs ≥70)
Survival is very similar regardless of the fractionation scheme used (mean 9.2 vs 8 months). However, 6, 12 and 18 months survival is greater in patients with standard fractionation We can conclude that in elderly patients, the variables age, KPS or fractionation scheme does not determine significant differences in survival.
Hypofractionation techniques or SBRT should be considered as an alternative in frail elderly patients to avoid prolonged treatment in time. The analysis of other parameters such as tumor stage or additional chemotherapy could also discriminate populations with different prognostic.

PV-0228

Size and impact of intra-fractional changes in baseline shift during lung SBRT

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Purpose or Objective: A baseline shift can be defined as a shift of the target volume relative to its surrounding organs at risk (OAR). The baseline shift varies from day to day and can potentially lead to an overdosage of the OARs. In our clinic, the magnitude of the baseline shift is measured at the start of treatment in patients treated for solitary lung cancer. In case an OAR moves towards the target and the baseline shift exceeds the PRV margin, treatment is prevented. Limited data is available about the intra-fractional change of the baseline shift. The aim of this study is to determine if an intra-fractional change of the baseline shift necessitates multiple measurements to ensure safe delivery of SBRT.

Material and Methods: In this study a retrospective analysis was performed using the data of 87 patients, treated for lung cancer with SBRT in the period January 2010 to February 2014. Patients were treated according to one of three protocols: 3x18Gy (n=19), 5x11Gy (n=47), or 8x7.5Gy (n=21). Treatment delivery was performed using multiple (> 9) non-coplanar conformal beams or VMAT using 2 arcs. A planning risk volume (PRV) margin of 10mm was used standard around OARs (e.g. the heart and spinal cord). Smaller PRV margins, with a minimum of 3mm, were used in case prescriptions/constraints could not be met during planning.
Conebeam-CT scans were performed at the beginning, halfway, and at the end of each treatment fraction. Grey-value registrations of Conebeam-CT scans with Planning-CT scan were performed for both the target and the patient specific most critical OAR . The difference between the registrations is the baseline shift. The number of times the

vector length of the baseline shift exceeded the PRV margin during treatment was scored. In these cases, it was investigated whether or not this would result in overdose for the OAR.
Furthermore, the change in baseline shift was calculated for the first and second half of each fraction as well as for the fraction as a whole. The average vector length and standard deviation of the change in baseline shift were determined per patient and for the population as a whole. Data were stratified according to the applied protocol.

Results: Figure 1 shows the results of change in baseline shift during treatment. Slightly larger changes in baseline shift were seen in the 3x18Gy and 5x11Gy protocol. In 11 out of 460 treatment fractions, the baseline shift exceeded the PRV margin at the end of the treatment fraction. In none of the patients this exceeding led to overdosage.

Figure 1: Intra-fractional changes in baseline shift

	Average vector (SD) Protocol 3x18Gy	Average vector (SD) Protocol 5x11Gy	Average vector (SD) Protocol 8x7.5Gy
Start – Halfway RT	0.19 cm (0.20)	0.18 cm (0.14)	0.13 cm (0.10)
Halfway RT - End	0.19 cm (0.16)	0.18 cm (0.14)	0.12 cm (0.08)
Start - End	0.27 cm (0.24)	0.24 cm (0.19)	0.18 cm (0.13)

Conclusion: Intra-fractional baseline shift can vary substantially during treatment, especially in patients treated with a 3x18Gy or 5x11Gy protocol. However, clinical impact of changes in baseline shift during treatment were not found in this study. A single assessment of the baseline shift at the start of treatment ensures a safe treatment delivery.

PV-0229

IGRT for pediatric patients: How much can we reduce the dose?

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Purpose or Objective: In our institution, orthogonal kV X-rays is at present the preferred imaging method for children as imaging dose is a concern. In this study, we varied the CBCT acquisition parameters and investigated how much we can reduce dose, and still be able to perform a secure bone match in clinical practice.

Material and Methods: An Alderson phantom equivalent to an adult was CT scanned. Due to the absence of a real child size phantom only the head and neck was used. On our Varian Novalis Tx accelerator, we performed 12 full-fan 200° CBCT scans with different parameter settings. The number of projections, mA and ms were systematically decreased, while kV was constantly at 100. After each scan an automatic bone match was performed to investigate the ability to perform this kind of match, since this is our procedure in clinical practice. The image quality of the scans was visually inspected for noise and artefacts. Six of the scans were chosen for dose measurements relative to the standard preset for these types of scans. The relative dose measurements were performed using the RTI Barracuda system, consisting of a DCT10-pencil ion chamber positioned in the centre of the CTDI 16 cm diameter cylindrical phantom. The parameters from the scan comprising the largest dose reduction and with the ability to match were used for a new CBCT preset. The phantom was CBCT scanned with the old and the new preset. Additionally the phantom was four times repositioned slightly different and re-scanned. Four RTT's independently matched these CBCT scans with the original CT scan offline in order to validate the new preset.

Results: A dose reduction of up to a factor of 14 could be achieved by changing the full-fan CBCT scan parameters from 20 mA and 20 ms (standard preset) to 10 mA and 2 ms. Reducing the number of projections from 650 to 360 added no further dose reduction. The new imaging preset results in a total dose of only 0.39 mGy compared to 0.14 mGy for 2 orthogonal X-ray imaging. Table 1 shows the average match difference between the different presets. The maximum deviations are +/-0,5 mm and 0.6º. Figure 1a+b show the difference in image quality between the standard and the new preset.

Table 1 Average match difference between scans obtained with standarad preset and new.

Avg. Dev (cm)	Position 1	Position 2	Position 3	Position 4	Position 5
VRT	0.00	0.03	0.00	0.03	0.00
LNG	0.00	0.03	0.05	0.03	0.05
LAT	0.03	0.00	0.03	0.03	0.00
RTN(º)	0.03	0.18	0.03	0.63	0.03

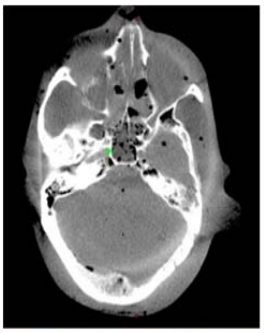

Figure 1a Scan obtained with std preset.

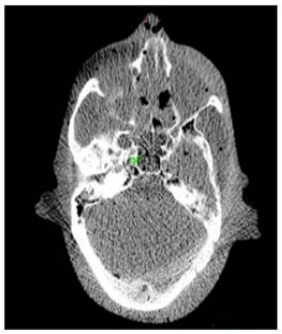

Figure 1b Scan obtained with new preset.

Conclusion: It is possible for RTT's to use low dose daily CBCT scans in paediatric radiation therapy and still perform a reliable automatic bone match.

PV-0230

Risk assessment of solid secondary malignancies in childhood Hodgkin Lymphoma after radiotherapy

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Purpose or Objective: This work develops risk assessments of solid secondary malignancies (SMN) after radiotherapy (RT) in survivors of childhood and adolescent Hodgkin Lymphoma (HL) patients (pts) using the Schneider's dose-response model for solid cancers induction (Theoretical Biology and Medical Modelling 2011), comparing conventional technique (3D-CRT) with IMRT delivered with Helical Tomotherapy (HT).